

## **AMENDMENTS TO THE CLAIMS**

The following listing of claims will replace all prior versions and listings of claims in the application.

### **LISTING OF CLAIMS**

1. (Currently Amended) A personal authentication method using iris images, comprising a registration process and an authentication process,

the registration process including steps of:

capturing, by a capture device, a plurality of iris images from a registrant;

obtaining feature data and a pupil diameter/iris diameter ratio opening degree index from each of the plurality of iris images and associating ~~[[that]]~~the obtained pupil diameter/iris diameter ratio opening degree index with ~~[[those]]~~the corresponding obtained feature data;

using pupil diameter/iris diameter ratios ~~the pupil opening degree indices~~ to index the obtained feature data of the registrant; and

performing data registration for the registrant including storing the obtained feature data, the pupil diameter/iris diameter ratios ~~opening degree indices~~, and index relationship between the obtained feature data and the pupil diameter/iris diameter ratios ~~opening degree indices~~, of the registrant, in an iris database ~~device~~, and

the authentication process including steps of:

capturing, by a capture device, an iris image from a person to be authenticated;

obtaining feature data and a pupil diameter/iris diameter ratio opening degree index, of the person to be authenticated, from the acquired iris image;

using a pupil diameter/iris diameter ratio ~~the pupil opening degree index~~ of the person to be authenticated to obtain the feature data, as feature data to be collated, that is associated with ~~[[that]]the pupil diameter/iris diameter ratio opening degree index~~ of the person to be authenticated from feature data registered in the iris database device;

comparing the feature data to be collated with the feature data obtained from the person to be authenticated in the authentication process to determine whether or not the person to be authenticated is the registrant; and

outputting the comparing result through an output device.

2. (Currently Amended) The personal authentication method of claim 1, wherein:

the registration process includes the step of registering the feature data together with the pupil diameter/iris diameter ratio ~~opening degree index~~ in the iris database in conjunction with the registrant; and

the authentication process includes the step of specifying the feature data to be collated from feature data registered in the iris database in conjunction with a registrant by comparing the pupil diameter/iris diameter ratio ~~opening degree index~~ obtained in the authentication process with the pupil diameter/iris diameter ratio ~~opening degree index~~ registered together with the feature data.

3. (Original) The personal authentication method of claim 2, wherein the registration process includes the step of at least registering three pieces of feature data of the registrant obtained from iris images in a pupil-contracted state, in a normal state, and in a pupil-dilated state, respectively.

4. (Original) The personal authentication method of claim 2, wherein the registration process includes the steps of:

acquiring a plurality of iris images having different pupil opening degrees from the registrant;

obtaining feature data from each of the plurality of acquired iris images; and

collating the plurality of pieces of feature data with each other to select feature data to be registered in the iris database from the plurality of pieces of feature data.

5. (Currently Amended) The personal authentication method of claim 2, wherein the authentication process is aborted when feature data having a pupil diameter/iris diameter ratio opening degree index which is close to the pupil diameter/iris diameter ratio opening degree index obtained in the authentication process by a predetermined difference is not registered for the registrant.

6. (Currently Amended) The personal authentication method of claim 5, wherein when the authentication process is aborted,

a preferable condition for capturing an iris image is estimated based on the pupil diameter/iris diameter ratio opening degree index obtained in the authentication process

and a pupil diameter/iris diameter ratio ~~opening-degree index~~ associated with registered feature data, and

the person to be authenticated is advised to re-acquire an iris image under the estimated capturing condition.

7. (Currently Amended) The personal authentication method of claim 1, wherein

the registration process includes the steps of:

acquiring a plurality of iris images having different pupil opening degrees from the registrant;

obtaining a relational expression between feature data and a pupil diameter/iris diameter ratio ~~opening-degree index~~ based on a plurality of pieces of feature data and pupil diameter/iris diameter ratios ~~opening-degree indices~~ obtained from the plurality of acquired iris images; and

registering parameters for expressing the relational expression in the iris database in conjunction with the registrant, and

the authentication process includes the step of obtaining a relational expression from parameters registered in the iris database in conjunction with a registrant and assigning the pupil diameter/iris diameter ratio ~~opening-degree index~~ obtained in the authentication process to the relational expression to obtain the feature data to be collated.

8. (Previously Presented) The personal authentication method of claim 7, wherein:

the registration process includes the step of reducing the number of the parameters before registration; and

the authentication process includes the step of restoring the reduced number of parameters by interpolation.

9. (Currently Amended) The personal authentication method of claim 1, wherein

the registration process includes the steps of:

acquiring a plurality of iris images having different pupil opening degrees from the registrant;

specifying registration feature data from a plurality of pieces of feature data obtained from the plurality of acquired iris images and obtaining a transformation rule for transforming the registration feature data to another feature data having a different pupil diameter/iris diameter ratio~~-opening degree index~~; and

registering the registration feature data and the transformation rule in the iris database in conjunction with the registrant,

the authentication process includes the step of generating the feature data to be collated using the pupil diameter/iris diameter ratio~~-opening degree index~~ obtained in the authentication process based on feature data and a transformation rule registered in the iris database in conjunction with a registrant.

10. (Cancelled)

11. (Currently Amended) A personal authentication method using iris images, comprising:

a first step of capturing, by a capture device, an iris image from a person to be authenticated;

a second step of obtaining feature data and a pupil diameter/iris diameter ratio ~~opening-degree index~~, of the person to be authenticated, from the iris image obtained at the first step;

~~a third step of~~ using the pupil diameter/iris diameter ratio ~~opening-degree index~~ of the person to be authenticated to obtain the feature data, as feature data to be collated, that is associated with ~~[[that]]the pupil~~ diameter/iris diameter ratio ~~opening-degree index~~ of the person to be authenticated from feature data registered in an iris database ~~device~~ in which data registration has been done using pupil diameter/iris diameter ratios ~~opening-degree indices~~;

a fourth step of comparing the feature data to be collated which is obtained at the third step with the feature data obtained at the second step to determine whether or not the person to be authenticated is a claimed registrant; and

a fifth step of outputting the comparing result through an output device.

12. (Currently Amended) The personal authentication method of claim 11, wherein:

the iris database stores at least one piece of feature data for each registrant together with a pupil diameter/iris diameter ratio~~opening degree index~~; and

at the third step, a pupil diameter/iris diameter ratio~~opening degree index~~ registered together with the feature data, which is selected from the at least one piece of feature data registered in the iris database in conjunction with the registrant, is compared with the pupil diameter/iris diameter ratio~~opening degree index~~ obtained at the second step to specify the feature data to be collated.

13. (Currently Amended) The personal authentication method of claim 11, wherein:

the iris database stores parameters which express a relational expression between feature data and a pupil diameter/iris diameter ratio~~opening degree index~~ for each registrant; and

at the third step, a relational expression is obtained from the parameter registered in the iris database in conjunction with a registrant, and the pupil diameter/iris diameter ratio~~opening degree index~~ obtained at the second step is assigned to the relational expression, whereby the feature data to be collated is obtained.

14. (Currently Amended) The personal authentication method of claim 11, wherein:

the iris database stores feature data and a transformation rule for transforming the feature data to another feature data having a different pupil diameter/iris diameter ratio~~opening degree index~~ for each registrant; and

at the third step, the feature data to be collated is generated using the pupil diameter/iris diameter ratio opening degree index obtained at the second step based on the feature data and the transformation rule registered in the iris database in conjunction with a registrant.

15. (Currently Amended) An iris registration device which performs data registration for iris authentication, comprising:

means for acquiring a plurality of iris images from a registrant;

means for obtaining feature data and a pupil diameter/iris diameter ratio opening degree index from each of the plurality of iris images and associating ~~[[that]]the~~ obtained pupil diameter/iris diameter ratio opening degree index with ~~[[those]]the~~ corresponding obtained feature data;

means for using the pupil diameter/iris diameter ratios opening degree indices to index the obtained feature data of the registrant; and

means for performing data registration for the registrant including storing the obtained feature data, the pupil diameter/iris diameter ratios opening degree indices, and index relationship between the obtained feature data and the pupil diameter/iris diameter ratios opening degree indices, of the registrant, in an iris database.

16. (Currently Amended) An iris authentication device which performs personal authentication using iris images, comprising:

means for acquiring an iris image from a person to be authenticated;



means for obtaining feature data and a pupil diameter/iris diameter ratio~~-opening degree index~~, of the person to be authenticated, from the acquired iris image;

means for using the pupil diameter/iris diameter ratio~~-opening degree index~~ of the person to be authenticated to obtain the feature data, as feature data to be collated, that is associated with ~~[[that]]~~the pupil diameter/iris diameter ratio~~-opening degree index~~ of the person to be authenticated from feature data registered in an iris database ~~device~~ in which data registration has been done using pupil diameter/iris diameter ratios~~-opening degree indices~~; and

means for comparing the feature data to be collated with the feature data obtained from the person to be authenticated to determine whether or not the person to be authenticated is a claimed registrant.

17. (Currently Amended) A memory encoded with a program for instructing a computer to execute personal authentication using iris images, comprising the steps of:

obtaining feature data and a pupil diameter/iris diameter ratio~~-opening degree index~~, of the person to be authenticated, from an iris image acquired from a person to be authenticated;

using the pupil diameter/iris diameter ratio~~-opening degree index~~ of the person to be authenticated to obtain the feature data, as feature data to be collated, that is associated with ~~[[that]]~~the pupil diameter/iris diameter ratio~~-opening degree index~~ of the person to be authenticated from feature data registered in an iris database ~~device~~ in which data registration has been done using pupil diameter/iris diameter ratios~~-opening degree indices~~; and

comparing the feature data to be collated with the feature data obtained from the person to be authenticated to determine whether or not the person to be authenticated is a claimed registrant.